DOCUMENT RESUME

ED 162 284 CS 004 488

AUTHOR Thomas, James L.
TITLE Time as a Factor in Reading Comprehension.
PUB DATE 76
NOTE 14p.; Study prepared at North Texas State University ; Best copy available

EDRS PRICE MF-$0.83 HC-$1.67 Plus Postage.
DESCRIPTORS Achievement; *Content Reading; Elementary Education; *Elementary School Science; Grade 4; *Illustrations; *Reading Comprehension; Reading Research; *Time Factors (Learning)

ABSTRACT

A number of areas concerning the use of pictorial illustrations in the comprehension of instructional materials still need empirical investigation. One such area, the influence of time on the reading comprehension of science materials, was explored in a study involving 108 fourth graders. Selections covering topics with which the students were least familiar were chosen from four fourth grade textbooks. The selections were reproduced on slides in one of three ways: text with color photographs, text with pictures which had been reduced to line drawings, and text without pictures. The subjects were divided into high, medium, and low achievement levels and each read selections on two different topics while being timed. After each reading, each subject was administered a reading comprehension test. Analysis of the results indicated that varying the pictorial illustrations did not affect the time required by students at the three achievement levels to comprehend the materials. (FL)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

U S DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

ED162284

Time As A Factor In Reading Comprehension

BEST COPY AVAILABLE

James L. Thomas

BA, MA, MSLS, EdD

Assistant Professor

School of Library & Information Sciences

North Texas State University

Denton, Texas

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

James L. Thomas

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) AND USERS OF THE ERIC SYSTEM."

Running Head: Time

CS004488

Time As A Factor In Reading Comprehension

Introduction

In reviewing the related literature into the use of pictorial illustrations that will facilitate a specific learning objective; namely, literal and inferential reading comprehension, it was found that a number of questionable areas still exist that need empirical investigation. Of specific interest in this investigation was the element of time. Therefore, this study attempted to answer the following question: Does the element of time influence the reading comprehension of science material for different levels of achievement?

Research Hypotheses

Three substantive hypotheses were tested in relation to the question. When time is held constant (covariate),

1. Students have equal scores in reading comprehension when the inclusion of pictorial illustrations with written text is varied.

2. Students of different achievement levels have differential scores in reading comprehension.

3. A relationship exists between different achievement levels and varying the inclusion of pictorial illustrations with written text on the scores by students in reading comprehension.

Review of Related Literature

Investigators to date are still questioning the use of pictorial illustrations in instructions (Travers & Alvarado,

1970; Hanes, 1973). Holliday (1973) maintained that "Although it is a commonly accepted generalization that pictures inserted in prose facilitate verbal learning, a recent analysis of the research literature provides little support for this generalization" (p. 201). Few researchers have systematically investigated the relationship between differing achievement levels and the effectiveness of pictorial illustrations as used in instruction (Allen, 1975).

Reading is an area which has received specific investigation into the use of pictures adjunct to the written text. Weintraub (1960) and Samuels (1967, 1970) indicated that pictures when used as adjuncts to printed text do not facilitate learning. Specifically, Weintraub found that reading comprehension was greatest when pictures were not used with the text. Samuels (1970) confirmed these findings and concluded that "There was almost unanimous agreement that pictures, when used as ajuncts to the printed text, do not facilitate comprehension" (p. 405). Samuels also explained that "pictures had no effect on the better reader, but among the poor readers, the presence of pictures interfered with learning . . ." (p. 399). However, Pederson (1970) in his testing of children reading one-two years below their placement pointed out that pictures neither facilitated nor hindered comprehension skills. Koenke and Otto (1969) found that with sixth grade students pictures facilitated the retention of factual information but not the comprehension of content. Holliday (1975) could not support the thesis "pictures don't help" nor the antithesis. However, he pointed out that

the results of his study "demonstrate that a certain kind of picture [simplified line drawing] can significantly facilitate a form of verbal comprehension" (p. 79).

Time is another factor that has received repeated investigations. Broadbent (1958, 1965) and Travers et al. (1964) hypotnesized that the human information processing system has a single-channel limited-capacity capability and that for information to be stored, irrelevant cues must be filtered out. Dwyer (1970) and Felming and Sherkhian (1972) indicated that abstract, low-information pictures are more effective in fixed-pace presentations or for a short duration, whereas realistic, high-information pictures which the learner self-paces yielded more effective or superior learning. However, Wicker (1970) investigating paired-associate learning and Paivio, Rogers, and Smythe (1968) in free recall discovered that detailed pictures did not significantly improve learning when compared with line drawings even under the self-pacing condition. Holliday (1973) has questioned these findings stating that "This is still another area of visualized instruction that needs to be investigated further before these kinds of experimental results can be directly used by instructional designers" (p. 205). Dwyer (1976) in his findings indicated that perhaps students dealing with a fixed-pace presentation are at a disadvantage when attempting to process the information contained in realistic pictures.

Methodology

Subjects

A total of 108 fourth grade students from three elementary schools were divided into three achievement levels of high (81% or above), medium (80% to 40%) and low (39% or below) using the combined percentile scores from the SRA reading and science measures. A tabulation between the reading and science measures using the Pearson correlation yielded r = .85 with a standard error of .001. The percentile ranges came from the SRA Assessment Survey Special Profile Chart. Cut off points for placement of the students into one of the three different levels appeared to be consistent with the established percentiles of the profile chart.

Materials

Four fourth grade textbooks were randomly selected from the most recent publications in the science area. A familiarly checklist of twenty topics within the science curriculum for this grade level was administered to determine those topics with which the students were least familiar. The four topics checked the least number of times were selected as representative of the curriculum. It was estimated that of the variety of illustrative techniques being used in textbooks, seventy-five percent were color photographs. So that each topic might be compared, the limitation to topics that had color photographs (T_1) which were continuous and which had written text was made. Each color photograph in all topics was reduced in cues to a

simplified line drawing (T_2) with a pink background with the same written text. Finally, all pictures were removed (T_3) with only the written text remaining. The Fry graph for estimating readability was used to insure that the material was understandable to those for whom it was written. All topics for all treatments were photographed and displayed on 2 x 2 slides using a Caramate projector.

Appraisal Instrument

The appraisal instrument was based on the guidelines set forth by Barrett (n.d.) and Smith and Barrett (1974) in the taxonomy of reading comprehension. This particular study was designed and limited to measuring literal and inferential reading comprehension as set forth by the taxonomy. Since students in science education are repeatedly called upon to remember explicit details within the material and to arrive at and formulate hypotheses based on the reading of the required material, this combination of skills appeared to be appropriate for the appraisal instrument.

A pilot study using the Kruder-Richardson 21 formula for estimating reliability was tabulated with the following results for each topic: Topic #1 - .78, Topic #2 - .78, Topic #3 - .82, and Topic #4 - .77.

Procedure

Students were randomly assigned across the three treatments. Each student was measured on two separate occasions over a different topic. Time was measured with a stop watch

and was taken from the moment the student began to read the topic until finished. The student read the topic on 2 x 2 slides and then took the reading comprehension test. All testing was conducted by the same person on a one-to-one basis.

Limitations

The following limitations were placed on this investigation:

1. only the elementary science subject area was examined;
2. only children identified as fourth grade students were used;
3. only one dependent variable was considered--reading comprehension;
4. only immediate recall of information was measured; and
5. no attempt was made to judge the conceptualization or combination of the written material with the illustrations in the selected topics.

Null Hypotheses

Three null hypotheses ($a = .05$) were tested in relation to the study--the possible influence of time on treatments and levels. Specifically, when adjusting for time spent reading (covariate),

1. There is no significant effect on varying the inclusion of pictorial illustrations with written text on students' reading comprehension in science.
2. There is no significant effect on different achievement

levels of students' reading comprehension in science.

3. There is no significant interactive effect of varying the inclusion of pictorial illustrations with written text and different levels of achievement on students' reading comprehension in science.

Analysis of Experimental Data

A two-way (3 x 3) analysis of variance design was performed on the comprehension scores. So that a comparison would be possible, the ANOVA was first tabulated on all scores. The results are displayed in Table 1 below.

Insert Table 1 about here

In order to examine the possible influence of time on the scores, an analysis of covariance was made adjusting all scores with time by treatment and level. The results of the analysis are displayed in Table 2.

Insert Table 2 about here

The ANOCOVA revealed that there were no statistically significant differences between the treatments ($F = 1.213$, NS), thus the first null hypotheses was accepted (see Table 2). The analysis, however, did reveal that there were statistically significant differences between the levels ($F = 44.167$, $p < .05$), thus the second null hypothesis was rejected. The

analysis also revealed that there were no statistically significant interactive effects between the treatment and levels ($F = .565$, NS), thus the third null hypothesis was accepted.

Conclusions

Findings in the area about the influence of time on the different treatments and achievement levels did answer at least one important question. It was felt that by measuring for the reading time taken for each topic and that by encouraging each student to take as much time needed to read the displayed topics such a procedure would represent a self-paced condition. After tabulating all scores and times and calculating a Pearson correlation between the two, it was found that there existed an extremely low correlation ($r = -.0122$). Thus, it was concluded that the time variable is not related across treatments and levels. This is to say that students in varying treatments and varying levels took approximately equal amounts of time to comprehend the materials. These findings, although on a different age level than used by Dwyer (1976) in his study, do not support a questionable area set forth by him that perhaps "students viewing the more realistic visuals did not have sufficient time to take full advantage of the information provided by the realistic detail" (p. 60). Additional studies should be conducted to determine if these conclusions are valid (1) for materials in different subject areas, (2) for an even wider manipulation of treatments along the realism continuum and (3) for different age levels.

TABLE 1

Analysis of Variance of Scores: Treatment by Level

Source of Variation	SS	DF	MSV	F
Treatment	49.389	2	24.694	1.577
Level	1254.167	2	627.083	40.044*
Interaction	25.778	4	6.444	.412
Residual	1550.333	99	15.660	
Total	2879.667	107		

*$p < .05$

TABLE 2

Analysis of Covariance of Scores

When Adjusting For Time

Source of Variation	SS	DF	MSV	F
Treatment	36.379	2	18.189	1.213
Level	1324.710	2	662.355	44.167*
Interaction	33.980	4	8.477	.565
Residual	1469.660	98	14.997	
Total	2879.667	106		

*p < .05

References

Allen, W. H. Intellectual abilities and instructional media design. AV Communication Review, Summer 1975, 23, 139-170.

Broadbent, D. E. Information processing in the nervous system. Science, 1965, 3965, 457-462.

Broadbent, D. E. Perception and communication. New York: Pergamon, 1958.

Dwyer, F. M. The effect of IQ level on the instructional effectiveness of black-and-white and color illustrations. AV Communication Review, Spring 1976, 24, 49-62.

Dwyer, F. M. Exploratory studies in the effectiveness of visual illustrations. AV Communication Review, 1970, 18, 235-249.

Fleming, M. L., & Sherkhian, M. Influences of pictorial attributes on recognition memory. AV Communication Review, 1972, 20, 423-441.

Hanes, M. L. The research on how children learn from pictures. Viewpoints, March 1973, 49, 11-20.

Holliday, W. G. Critical analysis of pictorial research related to science education. Science Education. 1973, 5, 201-214.

Holliday, W. G. The effects of verbal and adjunct pictorial verbal information in science instruction. Journal of research in science teaching, January 1975, 12, 77-83.

Koenke, K., & Otto, W. Contribution of pictures to children's comprehension of the main idea in reading. Psychology

in the Schools, 1969, 6, 298-302.

Paivio, A., Rogers, T. B., & Smythe, P. C. Why are pictures easier to recall than words? Psychonomic Science, 1968, 2, 137-138.

Pederson, D. L. The effect of pictures on primary grade children's comprehension of basal readers (Doctoral dissertation, University of Minnesota, 1970). Dissertation Abstracts International, 1971, 32(01-A), 311. (University Microfilms No. 18875).

Samuels, S. J. Attentional process in reading: the effect of pictures on the acquisition of reading responses. Journal of Educational Psychology, 1967, 58, 337-342.

Samuels, S. J. Effects of pictures on learning to read. Review of Educational Research, June 1970, 40, 397-407.

Travers, R. M. W., & Alvarado, V. The design of pictures for teaching children in elementary school. AV Communication Review, Spring 1970, 18, 47-63.

Travers, R. M. W., McCormick, M. C., Van Mondfrans, A. P., & Williams, F. E. Research and theory related to audio-visual information transmission. Salt Lake City: University of Utah, Bureau of Educational Research, 1964.

Weintraub, S. The effect of pictures on the comprehension of a second grade basal reader (Doctoral dissertation, University of Illinois, 1960). Dissertation Abstracts, 1960, 21(06), 1428.

Wicker, F. W. On the locus of picture-word differences in paired-associate learning. Journal of verbal learning and verbal behavior, 1970, 9, 52-57.